## CLAIMS

**What is claimed is:**

1. A system for automatic debonding of workpieces, comprising:

a heating element for heating and reactivating a thermally activated adhesive, the heating element being movable along an x-axis and a y-axis;

a carrier for supporting and carrying a plurality of the workpieces thereon in the thermally activated adhesive, the carrier being mountable to the heating element;

a bimodal pitch adjustment device for aligning with individual ones of the workpieces and displacing said individual ones of the workpieces along a z-axis, the bimodal pitch adjustment device also being movable along the y-axis;

a detainment mechanism for receiving the workpieces when they are displaced from the carrier by the bimodal pitch adjustment device; and

a control processor for controlling operations of the system along the x, y, and z axes, the control processor allowing full control of all critical process parameters, including accurate and repeatable workpiece placement; controlled temperature and heat flow, and controlled mechanical removal pressure, temporal control, and variability.

2. The system of claim 1, wherein the bimodal pitch adjustment device allows for continual, high-speed removal of the workpieces from the carrier.

3. The system of claim 1, wherein the bimodal pitch adjustment device uses a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the detainment mechanism.

4. The system of claim 1, wherein the bimodal pitch adjustment device uses a beveled tooth that precisely aligns with one of the workpieces, the beveled tooth being tapered in at least two dimensions to provide a small contact area for said one of the workpieces.

5. The system of claim 1, wherein the detainment mechanism comprises a block and a retention feature removably mounted to the block.

6. The system of claim 5, wherein the block is formed from a material that does not react with either the thermally activated adhesive or the workpieces.

7. The system of claim 1, wherein the detainment mechanism uses spring-loaded keys to hold each individual workpiece once it has been placed into the detainment mechanism, and each of the workpieces is located in a fixture having workpiece-separating teeth.

8. The system of claim 7, wherein the keys are formed from a material that does not react with either the thermally activated adhesive or the workpieces.

9. The system of claim 1, further comprising a row realignment mechanism for realigning the workpieces in the detainment mechanism.

10. The system of claim 1, wherein each workpiece is a pico-sized slider row.

11. The system of claim 1, wherein the workpieces are spaced apart from each other at a first y-axis pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second y-axis pitch, that differs from the first y-axis pitch, when they are located in the detainment mechanism, and the system moves at least one of the heating element, the bimodal pitch adjustment device, and the detainment mechanism incrementally along the y-axis with respect to each other to facilitate alignment therebetween.

12. A system for automatic thermal debonding of workpieces, comprising:

a heating element for heating and reactivating a thermally activated adhesive, the heating element being movable along an x-axis and a y-axis;

a carrier for supporting and carrying a plurality of the workpieces thereon in the thermally activated adhesive, the carrier being mountable to the heating element;

a bimodal pitch adjustment device for aligning with individual ones of the workpieces and displacing said individual ones of the workpieces along a z-axis, the bimodal pitch adjustment device also being movable along the y-axis and allowing continual, high-speed removal of the workpieces from the carrier after an automated heating cycle is complete;

a detainment mechanism for receiving the workpieces when they are displaced from the carrier by the bimodal pitch adjustment device, the detainment mechanism comprising a block and a retention feature removably mounted to the block;

a row realignment mechanism for realigning the workpieces in the detainment mechanism along the z-axis; and

a control processor for controlling operations of the system along the x, y, and z axes, the control processor allowing full control of all critical process parameters, including accurate and repeatable workpiece placement; controlled temperature and heat flow, and controlled mechanical removal pressure, temporal control, and variability.

13. The system of claim 12, wherein the bimodal pitch adjustment device uses a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the detainment mechanism, the beveled tooth being tapered in at least two dimensions to provide a small contact area for said one of the workpieces.

14. The system of claim 12, wherein the detainment mechanism uses spring-loaded keys to hold each individual workpiece once it has been placed into the detainment mechanism, each of the workpieces is located in a fixture having workpiece-separating teeth, and the keys and the

block are formed from a material that does not react with either the thermally activated adhesive or the workpieces.

15. The system of claim 12, wherein each workpiece is a pico-sized slider row.

16. The system of claim 12, wherein the workpieces are spaced apart from each other at a first y-axis pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second y-axis pitch, that differs from the first y-axis pitch, when they are located in the detainment mechanism, and the system moves at least one of the heating element, the bimodal pitch adjustment device, and the detainment mechanism incrementally along the y-axis with respect to each other to facilitate alignment therebetween.

17. A system for automatic thermal debonding of workpieces, comprising:

a heating element for heating and reactivating a thermally activated adhesive, the heating element being movable along an x-axis and a y-axis;

a carrier for supporting and carrying a plurality of the workpieces thereon in the thermally activated adhesive, the carrier being mountable to the heating element;

a bimodal pitch adjustment device for aligning with individual ones of the workpieces and displacing said individual ones of the workpieces along a z-axis, the bimodal pitch adjustment device also being movable along the y-axis and allowing continual, high-speed removal of the workpieces from the carrier after an automated heating cycle is complete;

a detainment mechanism for receiving the workpieces when they are displaced from the carrier by the bimodal pitch adjustment device, the detainment mechanism comprising a block and a retention feature removably mounted to the block;

a row realignment mechanism for realigning the workpieces in the detainment mechanism along the z-axis;

a control processor for controlling operations of the system along the x, y, and z axes, the control processor allowing full control of all critical process parameters, including accurate and repeatable workpiece placement; controlled temperature and heat flow, and controlled mechanical removal pressure, temporal control, and variability; and wherein

the workpieces are spaced apart from each other at a first y-axis pitch when they are located in the carrier, and the workpieces are spaced apart from each other at a second y-axis pitch, that differs from the first y-axis pitch, when they are located in the detainment mechanism, and the system moves at least one of the heating element, the bimodal pitch adjustment device, and the detainment mechanism incrementally along the y-axis with respect to each other to facilitate alignment therebetween.

18. The system of claim 17, wherein the bimodal pitch adjustment device uses a beveled tooth to individually push the workpieces off of the carrier and place them directly onto the

detainment mechanism, the beveled tooth being tapered in at least two dimensions to provide a small contact area for said one of the workpieces.

19. The system of claim 17, wherein the detainment mechanism uses spring-loaded keys to hold each individual workpiece once it has been placed into the detainment mechanism, each of the workpieces is located in a fixture having workpiece-separating teeth, and the keys and the block are formed from a material that does not react with either the thermally activated adhesive or the workpieces.

20. The system of claim 17, wherein each workpiece is a pico-sized slider row.